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Evaluation of *in vitro* antioxidant, anti-inflammatory activities and photoprotective properties of methanolic extracts of fruits, leaves and bark of *Flacourtia indica*

D. M. S. T. Disanayake*[1] and C. S. K. Rajapakse[1]

[1]Department of Chemistry, Faculty of Science, University of Kelaniya, Sri Lanka
tharikadisanayake@gmail.com*

Many plant-derived compounds are used medicinally as therapeutic measures against various disorders. *Flacourtia indica* commonly known as "Uguressa" or "Katulovi" is a medicinal plant used in ayurvedic medicine in Sri Lanka for treatment of various diseases. Therefore, this study focused on evaluating the antioxidant, anti-inflammatory activities and photoprotective properties of methanolic extracts of fruits, leaves and bark of *Flacourtia indica*. Phytochemicals in leaves, fruits and bark of *Flacourtia indica* were extracted into methanol by Soxhlet extraction. The presence of bioactive compounds was qualitatively identified by phytochemical screening of methanolic extracts. The total phenolic content (TPC) of each extract was determined by Folin-Ciocalteu (F-C) method. The antioxidant activity of each extract was determined by 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and the anti-inflammatory activity of each extract was assessed by protein denaturation assay. Photoprotective properties of the extracts of leaves, fruits and bark of *Flacourtia indica* were evaluated by determining the sun protection factor (SPF) of each extract using a UV-visible spectrophotometric method and applying the Mansur equation. The results of phytochemical screening revealed the presence of steroids, tannins, saponins, alkaloids, proteins and phenols in three tested plant parts. The DPPH free radical scavenging activity, anti-inflammatory activity and photoprotective properties of tested extracts were in the order of leaf>bark>fruit. The highest DPPH radical scavenging activity (IC_{50} = 27.02 ± 0.25 µg/mL), anti-inflammatory activity (IC_{50}=186.08±0.80 µg/mL) and photoprotective property (SPF = 40.57 ± 0.11 at 2.0 mg/mL) were shown in the leaf extract. According to the results, extract of leaves of *Flacourtia indica* has high sunburn protection as sunscreens with SPF> 30 are considered as products with high sun protection and recommended by the most dermatologists. Among the three extracts, the methanolic leaf extract was rich in phenolics with TPC of 39.97±4.18 mg GAE/g of dry weight of plant material. According to the Pearson correlation, a strong positive correlation was observed between the TPC and antioxidant activity ($r=0.9730$, $p<0.05$) indicating a strong contribution of phenolics for antioxidant activity of leaves, fruits and bark of the plant. The results of this study revealed that the leaves of *Flacourtia indica* could be used as natural source rich in plant-derived antioxidant, anti-inflammatory and photoprotective agents, which can be used in the pharmaceutical industry and as additives in sunscreen formulations.

Keywords: Anti-inflammatory, Antioxidant, DPPH, SPF, *Flacourtia indica*

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